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ABSTRACT

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Sixteen 9-18 month normal/superior infants "played" in their home cribs with a two-channel operant "toy" which allowed free choice between alternate audio feedbacks. With more than 300,000 secs. of listening time in the response record, 12 babies successfully discriminated gross differences in auditory complexity while 10 discriminated fine differences in linguistic redundancy.

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Among the infant's major tasks in beginning to learn his native language is the necessity that he learn to recognize the distinctive cues that constitute the stream of speech. Recent research (Eimas, P., 1969; McCaffrey, 1969; Moffitt, 1968) has shown that babies younger than six months old can demonstrate remarkable acuity in closely regulated laboratory studies in discriminating some of the isolated markers that distinguish phoneme boundaries of synthetic and normal speech. Despite these important advances, very little is known about the more comprehensive aspects of receptive language development that allow a baby to organize stable and coherent linguistic categories based on samples of normal speech in settings that approximate his normal listening environment.

One report (Friedlander, 1968) has demonstrated that normal infants in the 11-15 month age range in the natural home environment can make consistent discriminative selections between natural language properties such as the identity of a speaker, voice intonation, and message redundancy. However, that study was conducted with only single infants being tested with each of the linguistic variables that were examined. It has remained unclear whether the observed effects represent a genuine indication of the evolution of important aspects of discriminative listening competence in preverbal babies.

The purpose of this study was to investigate selective listening discrimination for different levels of auditory complexity and language re-

dundancy in systematically chosen populations of infants at two age levels. It was hypothesized that the babies would reliably prefer to listen to more complex auditory stimuli when given a choice between grossly different high and low complexity selections. It was further hypothesized that infants succeeding in the complexity discrimination would make a far more subtle selection between verbal messages which differed in regulated values of redundancy and information content. Because of the intricacy of the redundancy selection task and the slender background of prior information, no hypothesis was made concerning the exact pattern of the infants' listening response behavior with respect to redundancy selection.

The subjects were 16 infants (8 male, 8 female) from graduate student homes at the University of Wisconsin. The infants were divided into two age groups. The younger group ranged from 9-13 months when testing began (mean: 10.8 months); the older group ranged from 15-18 months (mean: 15.6 months). All 16 infants were deemed normal or above normal in development according to ordinary growth and behavior indicators. All families were regarded as above average to superior in the degree to which the home environment supported the babies' linguistic development.

The babies' selective listening responses were recorded in the home with a toy-like automated instrumentation system (PLAYTEST) attached to the babies' cribs. This system is fully described elsewhere (Friedlander, 1968, 1970; Leuba & Friedlander, 1968). The babies were allowed to play with the two-choice, sound-producing system whenever they were in their cribs according to the mothers' normal child care routines. The infants' responses on either of the two knob-like toys activated one channel or the other of a stereo audio tape player. Responses were registered on a digital response recorder that accumulated records of response frequency and response duration.

Stimulus programs were presented in two phases. In the first phase the infants could choose between a medley of lullabies vs. a modified white noise electronic hum. The choice between these grossly different levels of auditory complexity was used as a means for screening which infants in the sample were capable of employing this technique to make what was regarded as an obvious selection between audio feedbacks with greater and lesser reinforcing potency.

The stimuli in the second phase consisted of two edited selections from a children's story in which alternating passages were narrated by male and female voices. Of this pair, the high redundancy, low information selection was a 20-second story segment with a type/token ratio of .103 (different words/total words); the low redundancy, high information selection was a 140 second story segment with a type/token ratio of .338.

Each infant was tested on multiple days in both phases according to a standard schedule. The investigator visited each home daily to transcribe data, adjust the stimulus programs as necessary, and to follow a periodic schedule for alternating the two channels of the audio feedback to prevent position artifact.

The 16 infants accumulated a total record of 331,706 seconds of listening response time in 489 days on which data were recorded (means: 30 sessions per child; 20,730 secs. listening per child). In the first phase the total response record was 94,053 secs. of listening response time for the lullabies and 30,695 secs. for the electronic noise. In the second phase there were totals of 132,213 secs. of listening response time for the low redundancy, high information story segment and 74,745 secs. for the high redundancy, low information story segment.

Due to individual differences among the babies and the great differences in the environmental conditions in the different homes, the data record showed a pattern of great variability in total response records and distribution of response selectivity from child to child. Consequently, basic tests of significance to determine discriminative listening were applied solely to the intra-subject record. Twelve of the sixteen infants displayed significant preference for the lullabies over the electronic noise. Of these twelve, seven babies showed unambiguously significant preference for the less redundant, higher information story sequence and three others showed a marginally significant preference for the more informational story sequence. The Wilcoxon Matched Pairs Test was used in the statistical comparison, at the .05 level of significance.

Both hypotheses were supported by the data, though not for all children, and the vast data record includes a number of provocative findings which are described at length in the complete report. Possibly the most noteworthy subordinate finding relates to a previously observed "cross over effect" (Friedlander, 1968). In this effect, an infant's listening response pattern shows a clearly observable shift from initial preference for the high redundancy, low information story segment to later preference for the low redundancy, high information story segment. It was clearly observed in six of the infants in this study. This effect is deemed to have substantial significance for both psychological development and infants' increasingly complex organization of receptive language capability.

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